

Optimal Planning of Transmission Line Charging Mode During Black Start of a Hydroelectric Unit

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Abstract : After the occurrence of blackouts, the most important subject is how fast the electric service is restored. Power system restoration is an immensely complex issue and there should be a plan to be executed within the shortest time period. This plan has three main stages of black start, network reconfiguration and load restoration. In the black start stage, operators and experts may face several problems, for instance, the unsuccessful connection of the long high-voltage transmission line connected to the electrical source. In this situation, the generator may be tripped because of the unsuitable setting of its line charging mode or high absorbed reactive power. In order to solve this problem, the line charging process is defined as a nonlinear programming problem, and it is optimized by using GAMS software in this paper. The optimized process is performed on a grid that includes a 250 MW hydroelectric unit and a 400 KV transmission system. Simulations and field test results show the effectiveness of optimal planning.

Keywords : power system restoration, black start, line charging mode, nonlinear programming

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